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Larsson et al.

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(54) **INTELLIGENT PORTABLE PHONE WITH DUAL MODE OPERATION FOR AUTOMOBILE USE**

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(22) Filed: **Oct. 29, 1999**

(51) **Int. Cl.**[7] **H04Q 7/32**

(52) **U.S. Cl.** **455/553.1**; 455/41.2; 455/41.3; 455/11.1; 455/556.1; 455/557

(58) **Field of Search** 455/41, 11.1, 7, 455/552, 553, 556, 575, 88, 41.2, 41.3, 553.1, 556.1

(56) **References Cited**

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OTHER PUBLICATIONS

The persons who contributed to this specification are listed in Appendix II on p. 423, "Specification of the Bluetooth System", Specification vol. 2, Profiles, *Bluetooth*™, Jul. 26, 1999.

* cited by examiner

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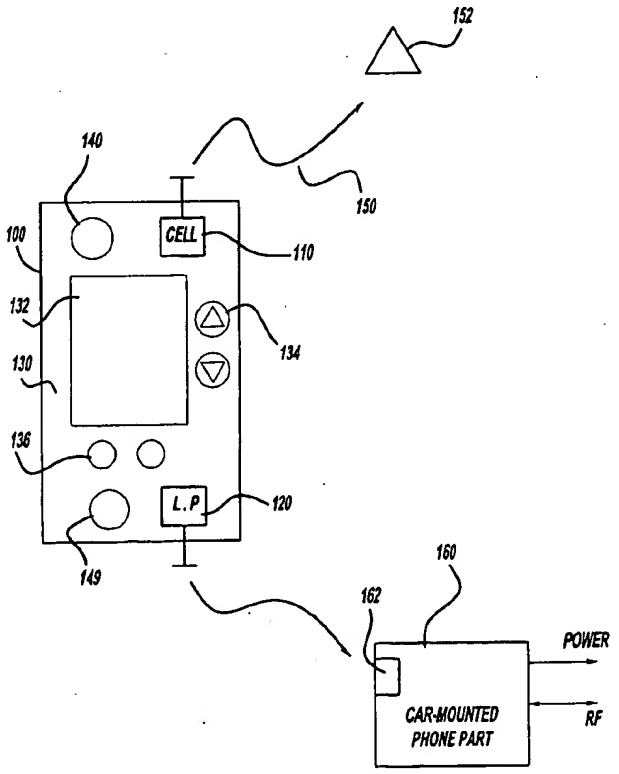
(74) *Attorney, Agent, or Firm*—Harness, Dickey & Pierce, PLC

(57) **ABSTRACT**

A system for operating a cellular phone using Bluetooth with a car kit is described. The Bluetooth protocol is used to communicate between the cellular phone and the car kit. A communication can be established between the cellular phone and the said car kit. In one mode, the car kit can be made to assume the identity of the cellular phone and transmit as if it were the cellular phone itself. In another mode, the car kit can become a hands-free set for the cellular phone which communicates with the cellular phone via Bluetooth.

9 Claims, 14 Drawing Sheets



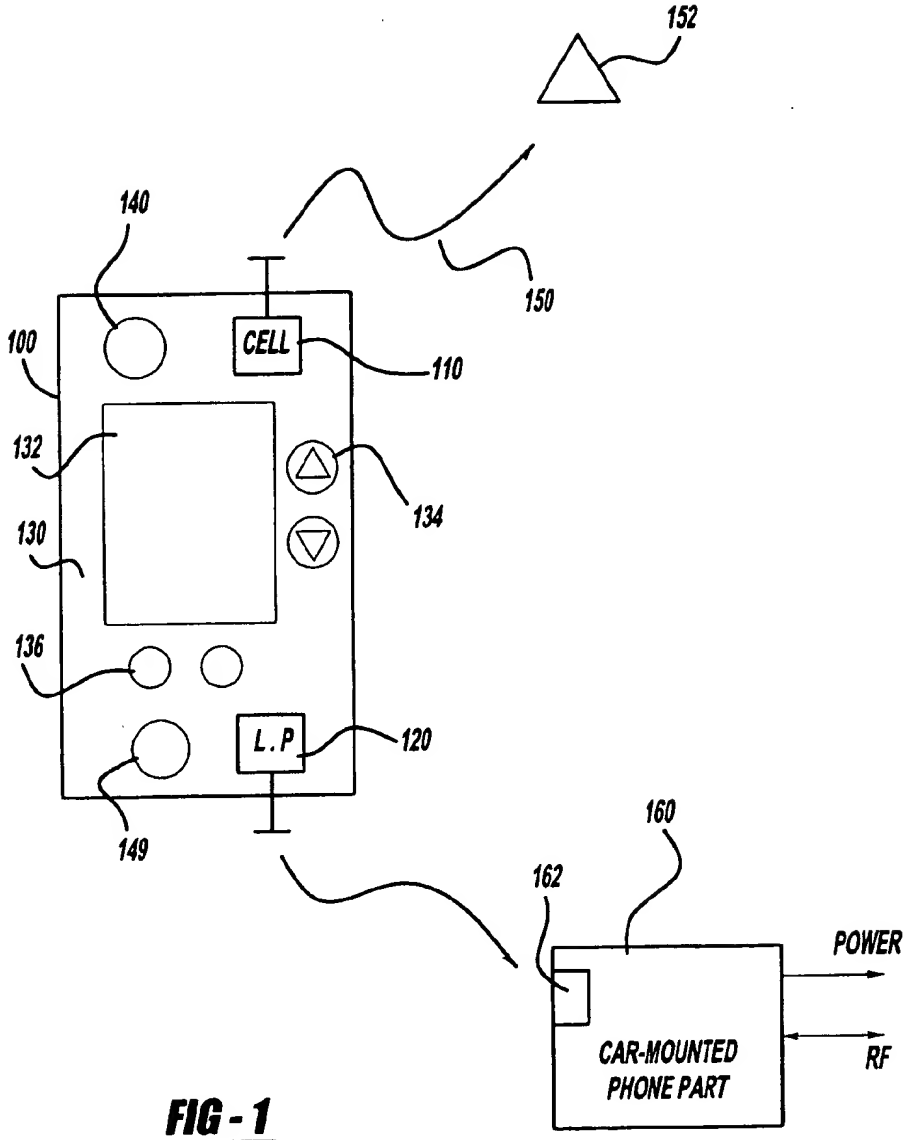

152
140
150
100
CELL
110
132
134
130
136
L.P
120
149
160
162
POWER
CAR-MOUNTED
PHONE PART
RF

FIG - 1

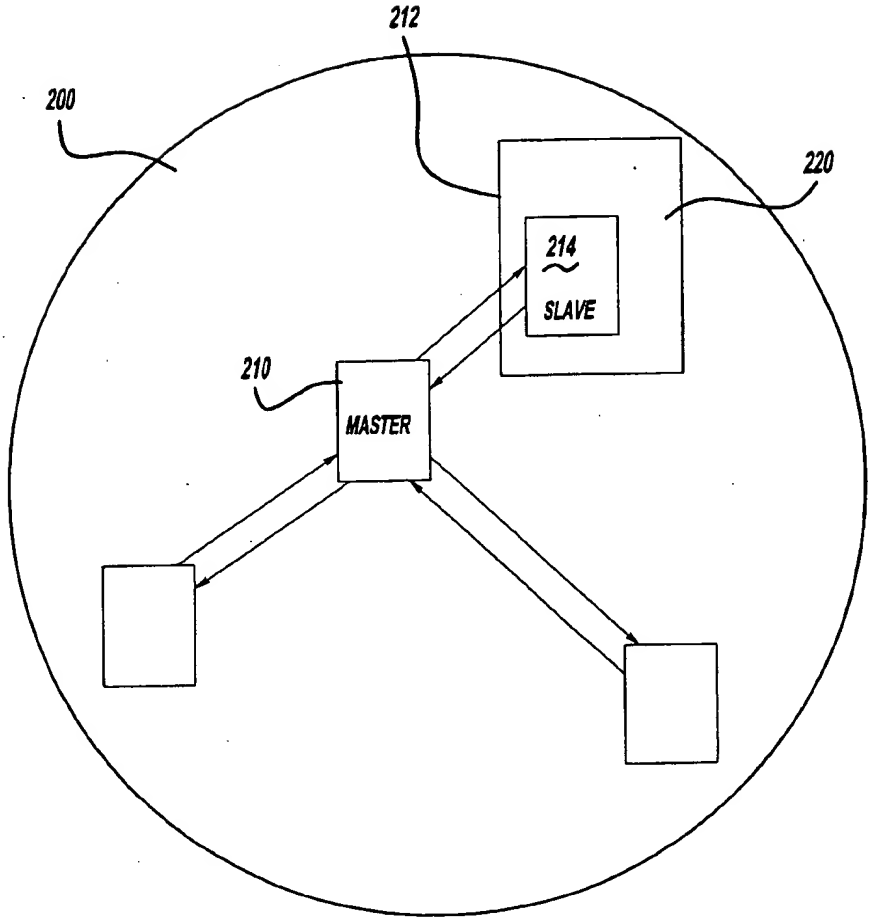


FIG - 2

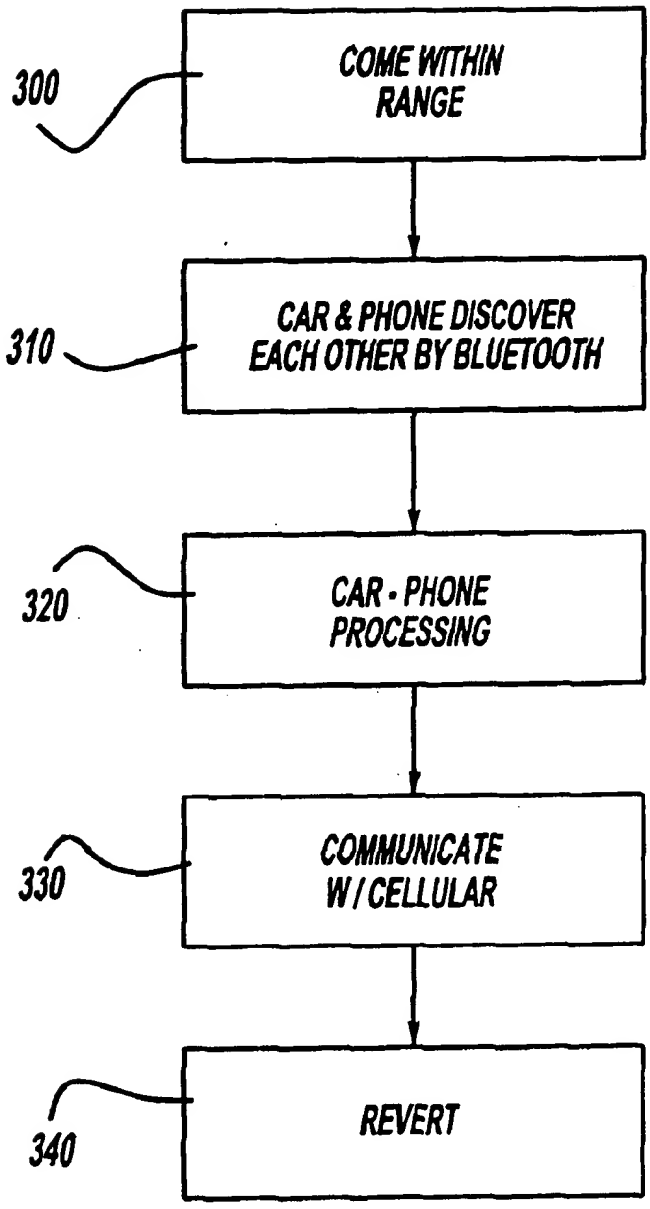

300
COME WITHIN RANGE
310
CAR & PHONE DISCOVER EACH OTHER BY BLUETOOTH
320
CAR - PHONE PROCESSING
330
COMMUNICATE W/ CELLULAR
340
REVERT

FIG - 3

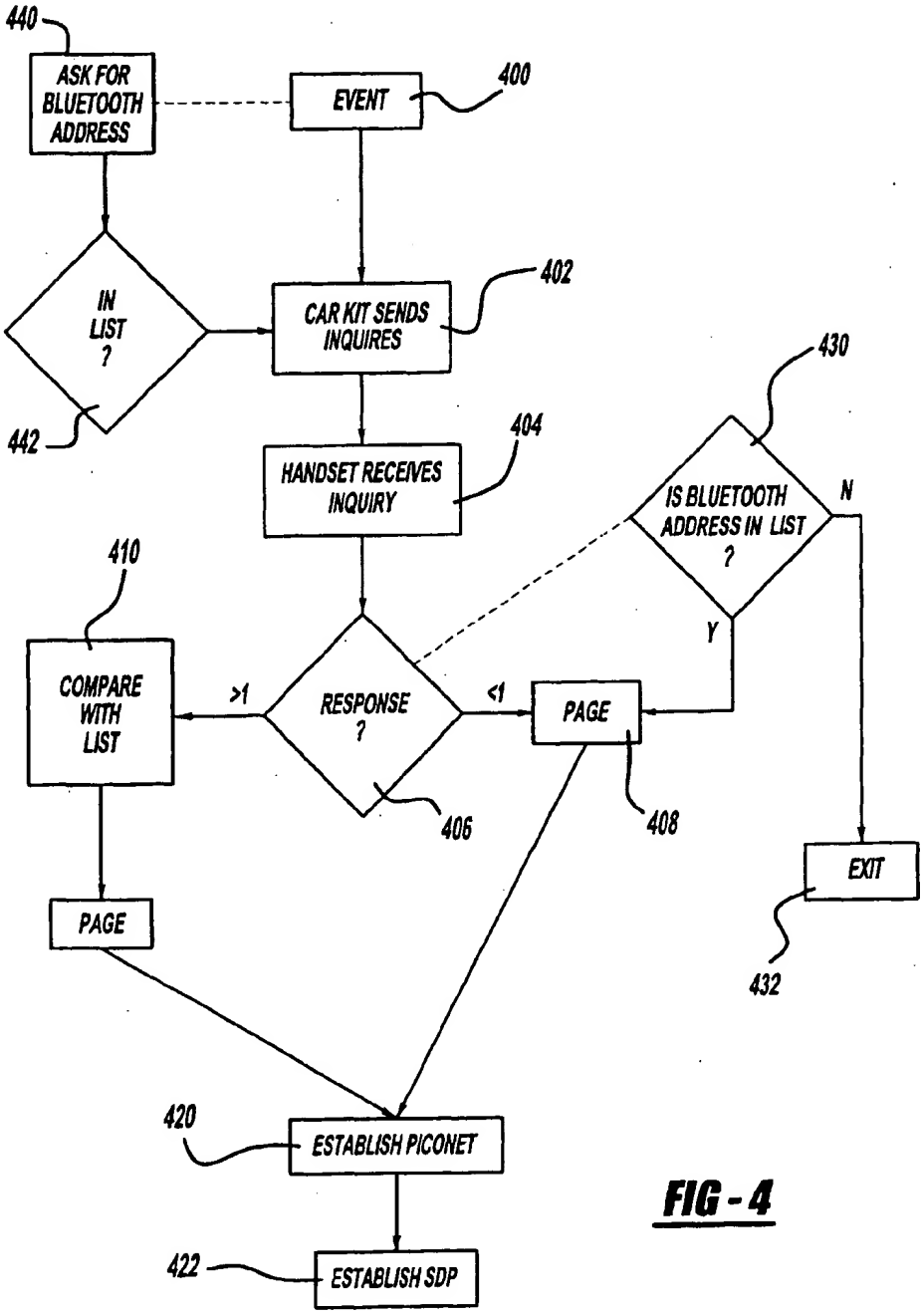

440
ASK FOR BLUETOOTH ADDRESS
EVENT
400
IN LIST ?
442
CAR KIT SENDS INQUIRES
402
HANDSET RECEIVES INQUIRY
404
430
IS BLUETOOTH ADDRESS IN LIST ?
N
Y
410
COMPARE WITH LIST
>1
RESPONSE ?
<1
PAGE
406
408
EXIT
432
PAGE
420
ESTABLISH PICONET
422
ESTABLISH SDP

FIG - 4

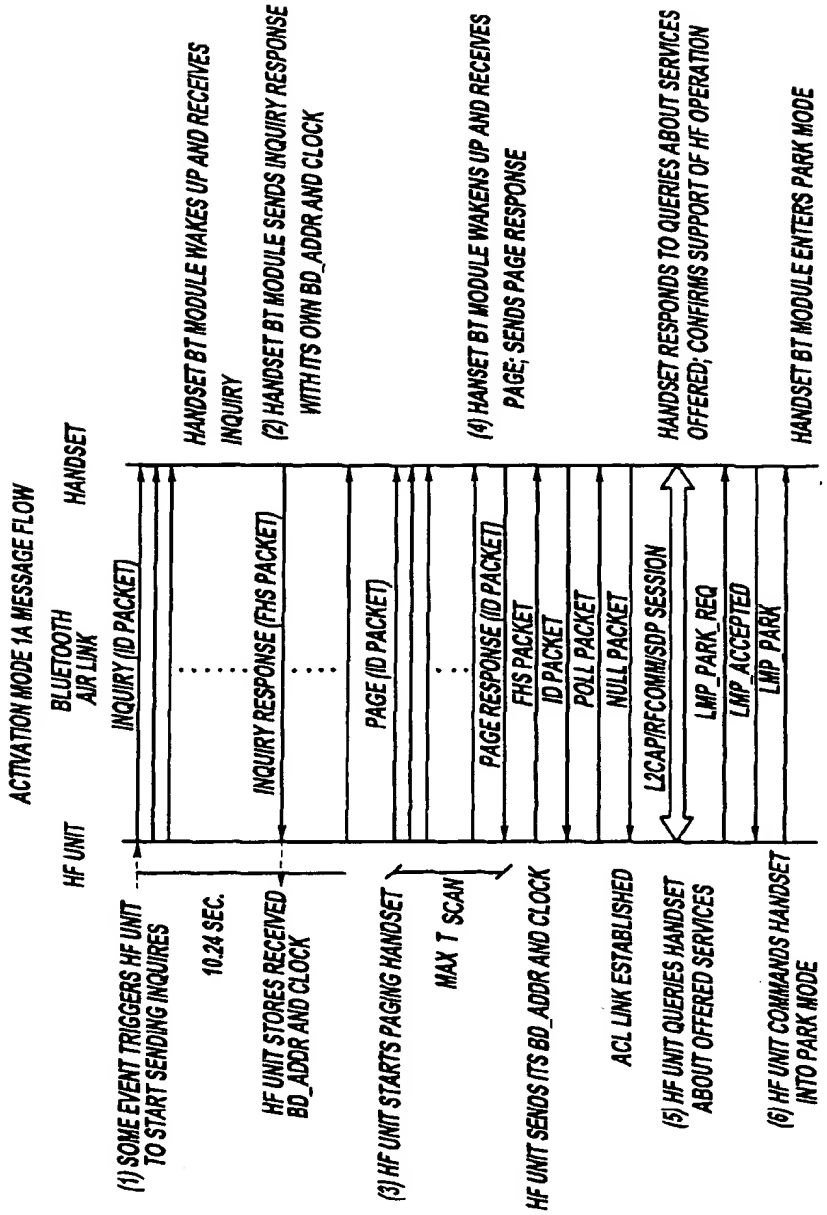

ACTIVATION MODE 1A MESSAGE FLOW
HF UNIT
BLUETOOTH AIR LINK
HANDSET
INQUIRY (ID PACKET)
HANDSET BT MODULE WAKES UP AND RECEIVES INQUIRY
INQUIRY RESPONSE (FHS PACKET)
(2) HANDSET BT MODULE SENDS INQUIRY RESPONSE WITH ITS OWN BD_ADDR AND CLOCK
PAGE (ID PACKET)
(4) HANSET BT MODULE WAKENS UP AND RECEIVES PAGE; SENDS PAGE RESPONSE
PAGE RESPONSE (ID PACKET)
FHS PACKET
ID PACKET
POLL PACKET
NULL PACKET
L2CAP/RFCOMM/SDP SESSION
HANDSET RESPONDS TO QUERIES ABOUT SERVICES OFFERED; CONFIRMS SUPPORT OF HF OPERATION
LMP_PARK_REQ
LMP_ACCEPTED
LMP_PARK
HANDSET BT MODULE ENTERS PARK MODE
(1) SOME EVENT TRIGGERS HF UNIT TO START SENDING INQUIRES
10.24 SEC.
HF UNIT STORES RECEIVED BD_ADDR AND CLOCK
(3) HF UNIT STARTS PAGING HANDSET
MAX T SCAN
HF UNIT SENDS ITS BD_ADDR AND CLOCK
ACL LINK ESTABLISHED
(5) HF UNIT QUERIES HANDSET ABOUT OFFERED SERVICES
(6) HF UNIT COMMANDS HANDSET INTO PARK MODE

FIG - 5

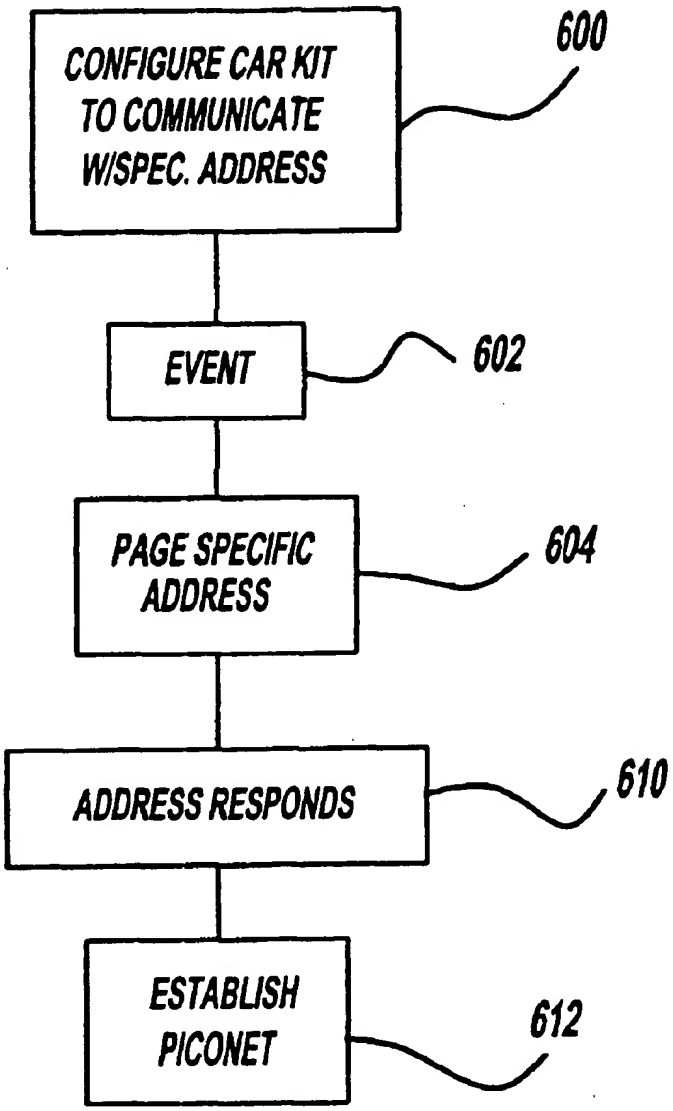

CONFIGURE CAR KIT TO COMMUNICATE W/SPEC. ADDRESS
600
EVENT
602
PAGE SPECIFIC ADDRESS
604
ADDRESS RESPONDS
610
ESTABLISH PICONET
612

FIG - 6

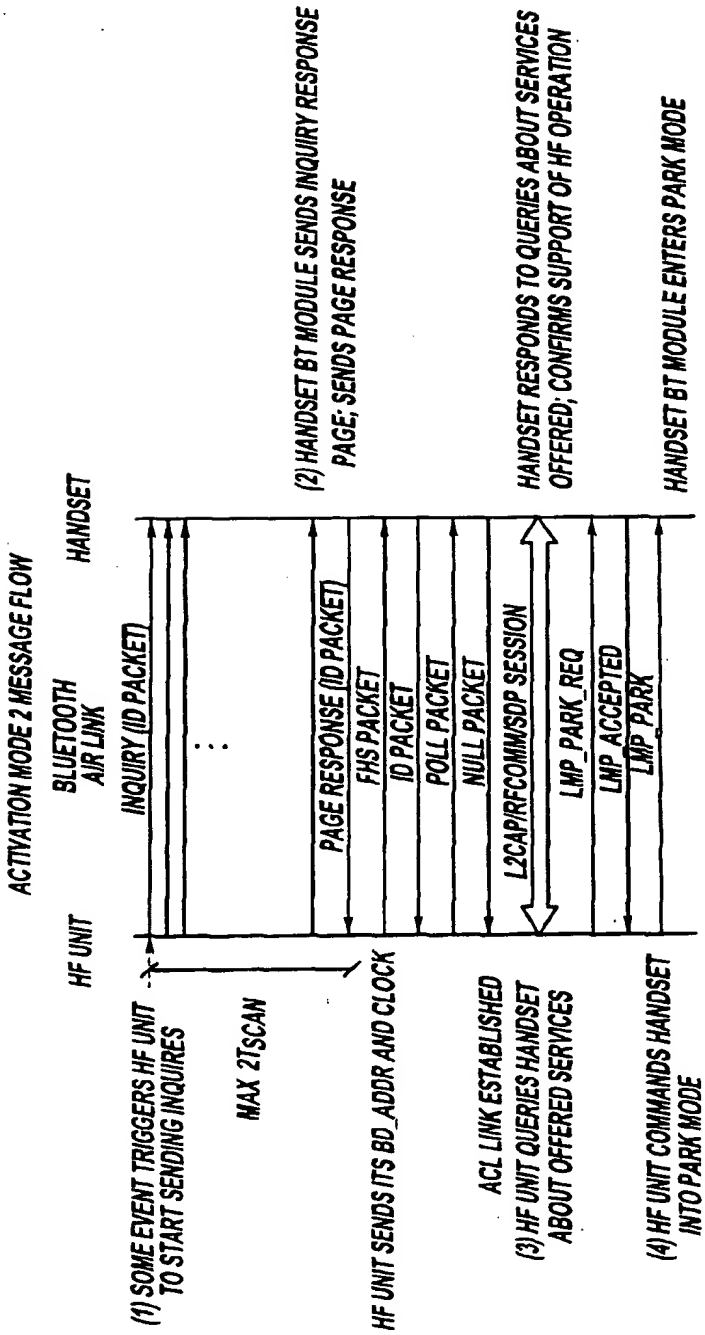

ACTIVATION MODE 2 MESSAGE FLOW
HF UNIT
BLUETOOTH AIR LINK
HANDSET
INQUIRY (ID PACKET)
(1) SOME EVENT TRIGGERS HF UNIT TO START SENDING INQUIRES
MAX 2TSCAN
PAGE RESPONSE (ID PACKET)
FHS PACKET
ID PACKET
POLL PACKET
NULL PACKET
(2) HANDSET BT MODULE SENDS INQUIRY RESPONSE PAGE; SENDS PAGE RESPONSE
HF UNIT SENDS ITS BD_ADDR AND CLOCK
L2CAP/RFCOMM/SDP SESSION
LMP_PARK_REQ
LMP_ACCEPTED
LMP_PARK
HANDSET RESPONDS TO QUERIES ABOUT SERVICES OFFERED; CONFIRMS SUPPORT OF HF OPERATION
ACL LINK ESTABLISHED
(3) HF UNIT QUERIES HANDSET ABOUT OFFERED SERVICES
(4) HF UNIT COMMANDS HANDSET INTO PARK MODE
HANDSET BT MODULE ENTERS PARK MODE

FIG - 7

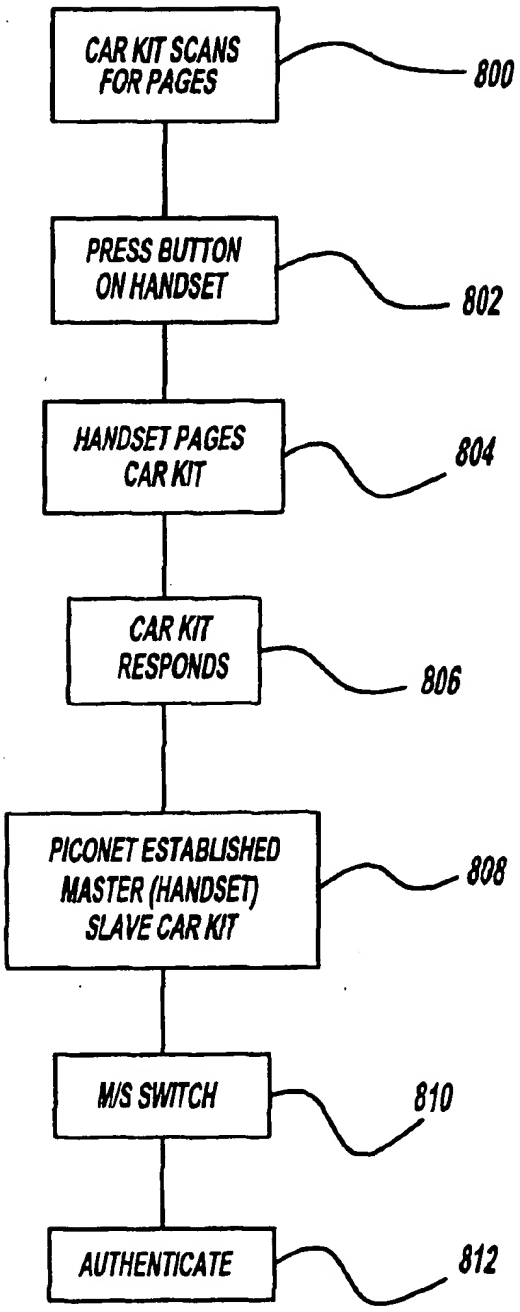

CAR KIT SCANS FOR PAGES
800
PRESS BUTTON ON HANDSET
802
HANDSET PAGES CAR KIT
804
CAR KIT RESPONDS
806
PICONET ESTABLISHED MASTER (HANDSET) SLAVE CAR KIT
808
M/S SWITCH
810
AUTHENTICATE
812

FIG - 8

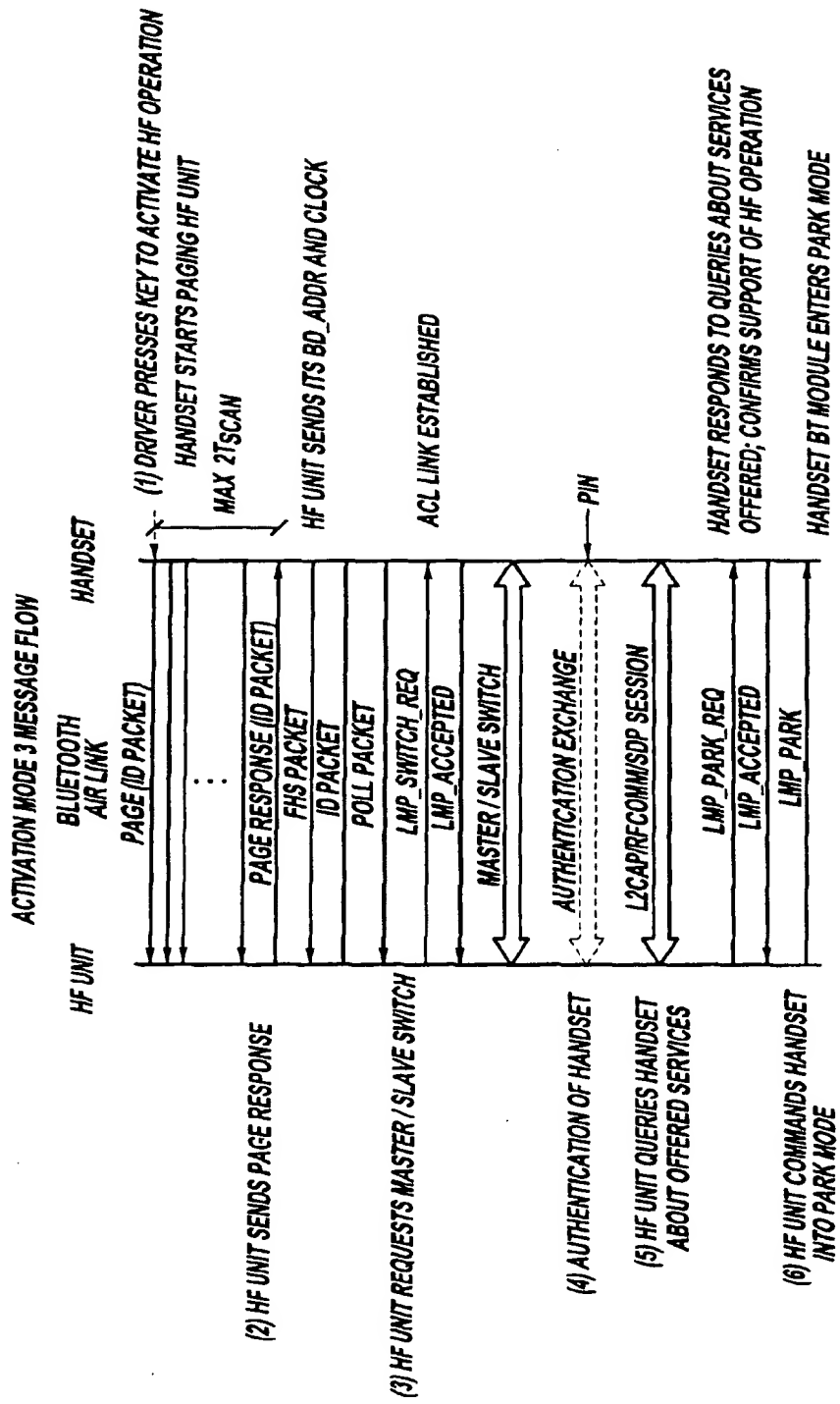

ACTIVATION MODE 3 MESSAGE FLOW
HF UNIT
BLUETOOTH AIR LINK
HANDSET
(1) DRIVER PRESSES KEY TO ACTIVATE HF OPERATION
HANDSET STARTS PAGING HF UNIT
MAX 2T SCAN
HF UNIT SENDS ITS BD_ADDR AND CLOCK
ACL LINK ESTABLISHED
PIN
HANDSET RESPONDS TO QUERIES ABOUT SERVICES OFFERED; CONFIRMS SUPPORT OF HF OPERATION
HANDSET BT MODULE ENTERS PARK MODE
PAGE (ID PACKET)
PAGE RESPONSE (ID PACKET)
FHS PACKET
ID PACKET
POLL PACKET
LMP_SWITCH_REQ
LMP_ACCEPTED
MASTER / SLAVE SWITCH
AUTHENTICATION EXCHANGE
L2CAP/RFCOMM/SDP SESSION
LMP_PARK_REQ
LMP_ACCEPTED
LMP_PARK
(2) HF UNIT SENDS PAGE RESPONSE
(3) HF UNIT REQUESTS MASTER / SLAVE SWITCH
(4) AUTHENTICATION OF HANDSET
(5) HF UNIT QUERIES HANDSET ABOUT OFFERED SERVICES
(6) HF UNIT COMMANDS HANDSET INTO PARK MODE

FIG - 9

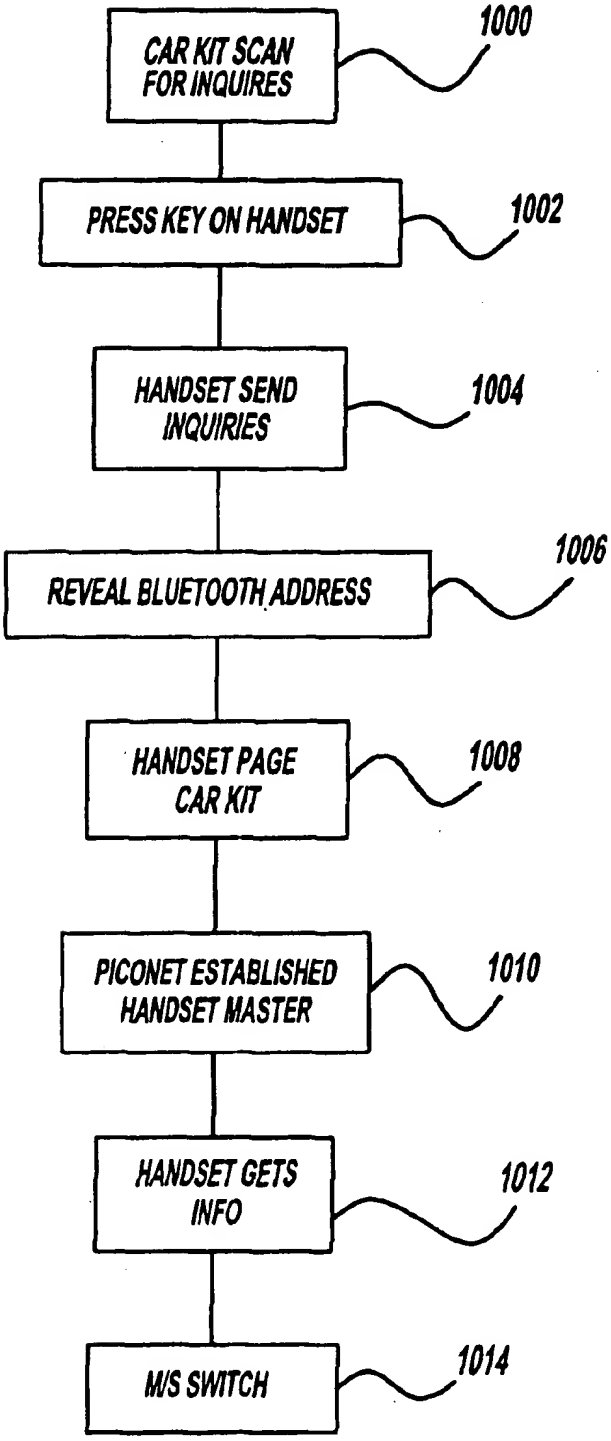

CAR KIT SCAN FOR INQUIRES
1000
PRESS KEY ON HANDSET
1002
HANDSET SEND INQUIRIES
1004
REVEAL BLUETOOTH ADDRESS
1006
HANDSET PAGE CAR KIT
1008
PICONET ESTABLISHED HANDSET MASTER
1010
HANDSET GETS INFO
1012
M/S SWITCH
1014

FIG - 10

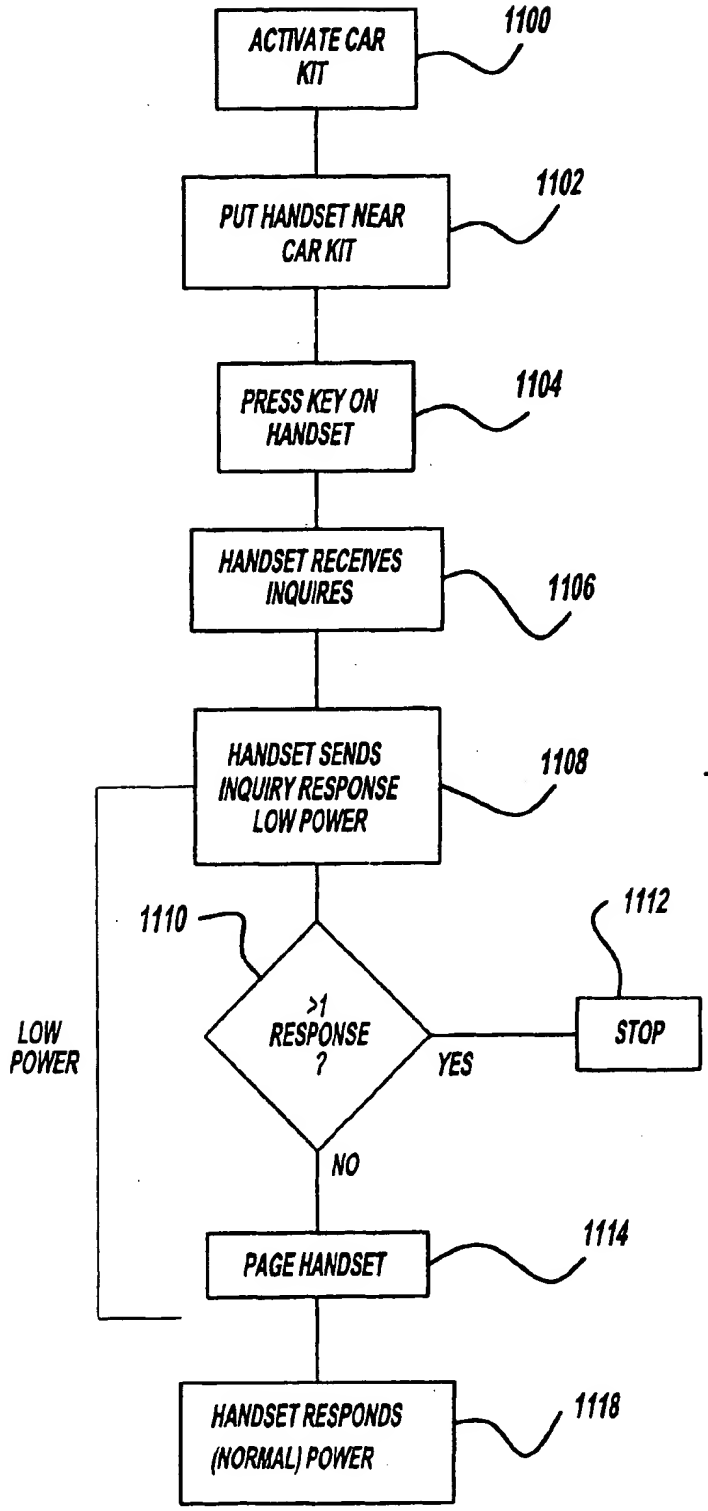

ACTIVATE CAR KIT
1100
PUT HANDSET NEAR CAR KIT
1102
PRESS KEY ON HANDSET
1104
HANDSET RECEIVES INQUIRES
1106
HANDSET SENDS INQUIRY RESPONSE LOW POWER
1108
1110
>1 RESPONSE ?
1112
STOP
YES
LOW POWER
NO
PAGE HANDSET
1114
HANDSET RESPONDS (NORMAL) POWER
1118

FIG - 11

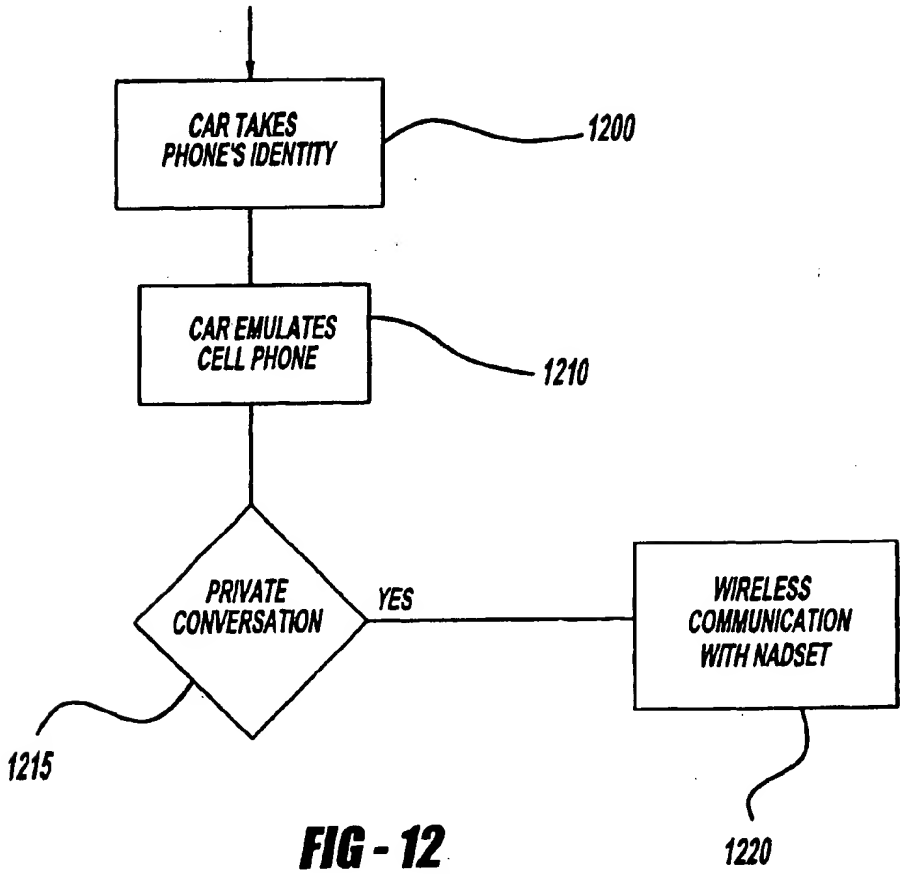

CAR TAKES PHONE'S IDENTITY
1200
CAR EMULATES CELL PHONE
1210
PRIVATE CONVERSATION
YES
WIRELESS COMMUNICATION WITH NADSET
1215
1220

FIG - 12

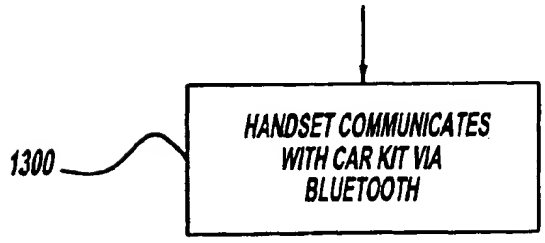

HANDSET COMMUNICATES WITH CAR KIT VIA BLUETOOTH
1300

FIG - 13

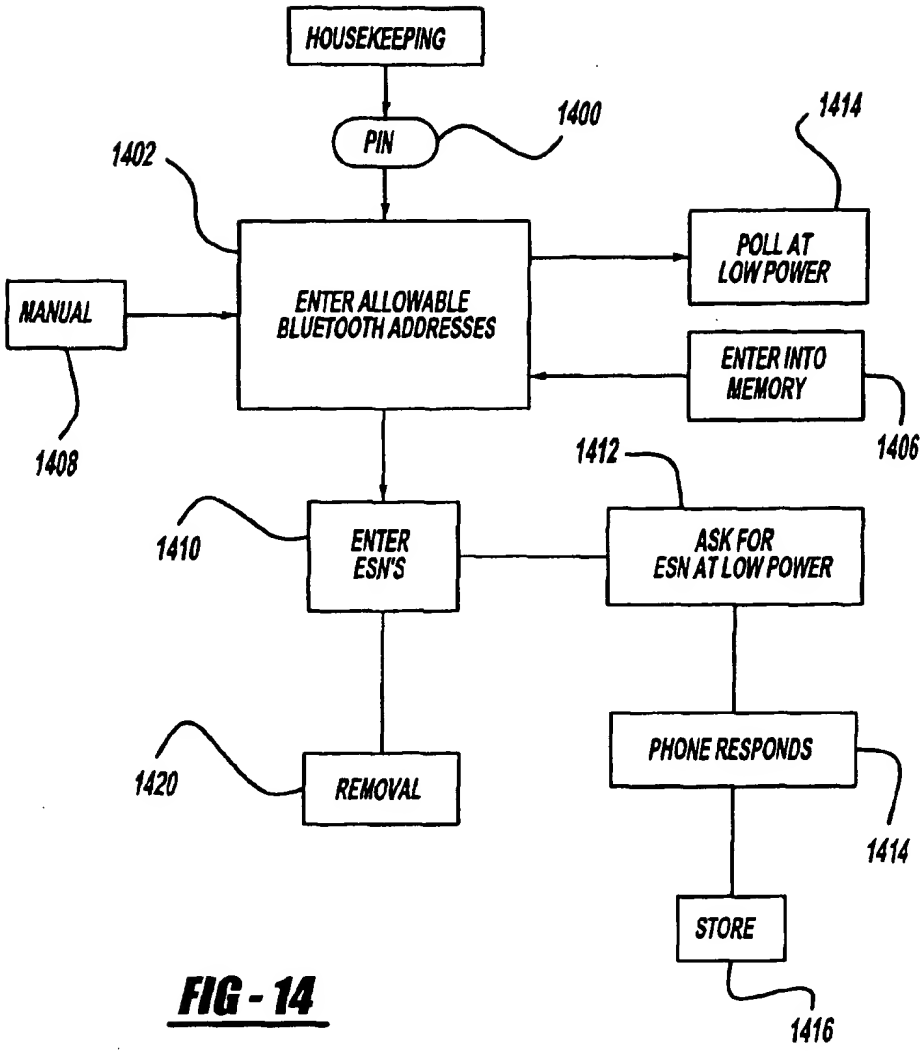

HOUSEKEEPING
PIN
1400
1402
1414
POLL AT LOW POWER
MANUAL
ENTER ALLOWABLE BLUETOOTH ADDRESSES
ENTER INTO MEMORY
1408
1406
1412
1410
ENTER ESN'S
ASK FOR ESN AT LOW POWER
1420
REMOVAL
PHONE RESPONDS
1414
STORE
1416

FIG - 14

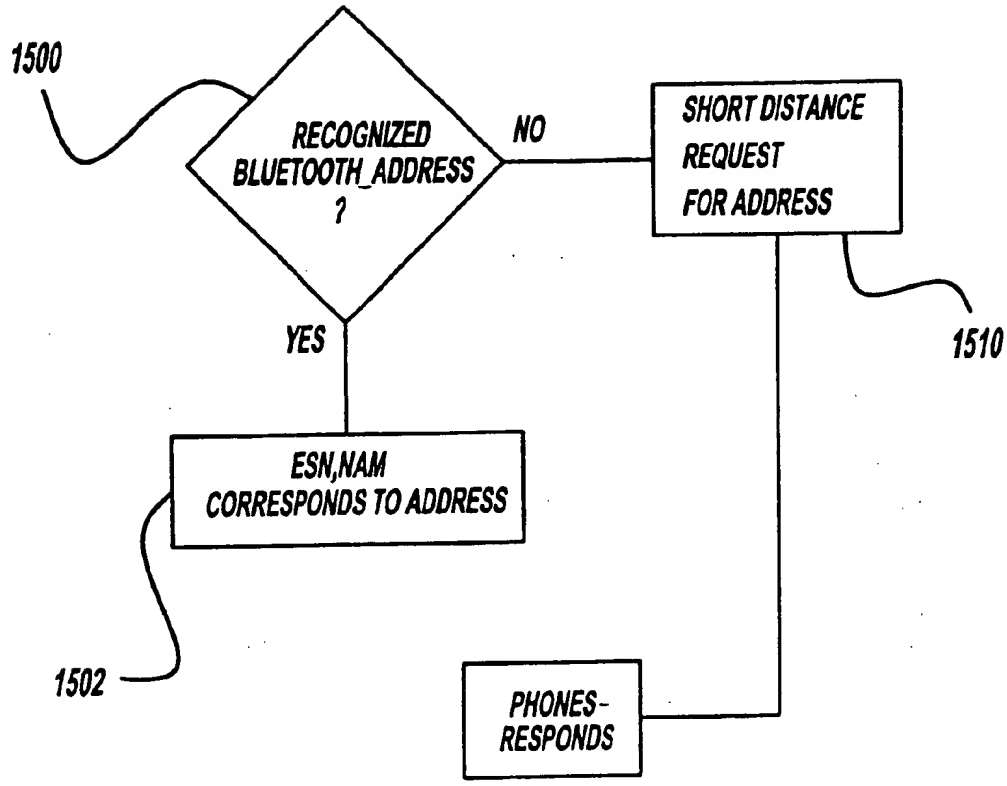

1500
RECOGNIZED BLUETOOTH_ADDRESS ?
NO
SHORT DISTANCE REQUEST FOR ADDRESS
1510
YES
ESN,NAM CORRESPONDS TO ADDRESS
1502
PHONES-RESPONDS

FIG - 15

INTELLIGENT PORTABLE PHONE WITH DUAL MODE OPERATION FOR AUTOMOBILE USE

BACKGROUND

Portable telephones such as cellular telephones are in common use. A hand-held cellular telephone enjoys the convenience of portability. A car mounted cellular phone is also known.

A car-mounted cellular phone has certain advantages. For example, since the car-mounted phone uses an external antenna, it may get better cellular reception. An external antenna may also enable the car kit to transmit with higher power than is allowable with a hand held phone.

A "car kit" is often an interface between the automobile and the telephone. The car kit can act as a part of the hand-held cellular phone. The hand-held phone plugs into the car kit, and uses the structure of the car kit for transmission and reception, e.g., to an external antenna. The car kit can also have a hands-free kit that allows the user to talk on the telephone without using their hands. Some jurisdictions, in fact, require a user's hands to be free while driving.

Automobile-mounted communication devices can be installed into automobiles for various purposes. For example, the Telematics (TM) and Mayday (TM) systems install a transceiver into the vehicle. These systems can be used for signaling law enforcement authorities when the automobile is stolen or carjacked. These systems include radios therein.

Car kits can often only be used with the cellular phone itself being present. If the user forgets to bring their phone into the car, then the car kit becomes useless.

An automobile mounted cellular phone can be used without a hand-held cellular phone being present. However, this requires that the automobile mounted cellular phone have a separate telephone number from the handheld cellular phone, and also requires that the user pay two monthly service fees.

SUMMARY

The present application defines a new telephone interface device adapted to be mounted in a vehicle. The device can interface with a portable telephone, and take on the character of the portable telephone (from claims here).

According to a particularly preferred embodiment, the system uses a low power consumption, wireless protocol, which includes automated service discovery, spread spectrum operation, clock synchronization, defines unique identities, and allows multiple access via time slot system. According to a particularly preferred embodiment, this protocol can be the so-called Bluetooth protocol.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects will be described in detail with reference to the accompanying drawings, wherein:

FIG. **1** shows a block diagram of the system;

FIG. **2** illustrates a basic Bluetooth piconet;

FIG. **3** illustrates basic system operation;

FIG. **4** illustrates the car kit and the hand held phone discovering each other;

FIG. **5** illustrates the message flow for FIG. **4**;

FIG. **6** illustrates system operation in accordance with another mode;

FIG. **7** illustrates the message flow for FIG. **6**;

FIG. **8** illustrates system operation in accordance with another mode;

FIG. **9** illustrates the message flow for FIG. **8**;

FIG. **10** illustrates system operation in accordance with another mode;

FIG. **11** illustrates system operation in accordance with another mode;

FIG. **12** illustrates a flowchart of the operation of the system;

FIG. **13** illustrates a flowchart of the operation of the system in another mode;

FIG. **14** illustrates a housekeeping operation;

FIG. **15** illustrates system operation in accordance with another mode.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A block diagram of the overall system is shown in FIG. **1**. A hand-held portable telephone has two transceivers therein: shown as a cellular transceiver **110**, and a low power transceiver **120**. The cellular transceiver **110** transmits on a cellular band, e.g., 800–900 MHz, at cellular power levels, e.g., 0.2–0.6 watts. The lower power transceiver **120** transmits at much lower power levels, e.g., less than 1 mw, more preferably 100 microwatts or less. The lower power transceiver can be, for example, a Bluetooth transceiver which operates using the Bluetooth standard.

The hand held cellular telephone includes, as conventional, a user interface **130** which includes a menu **132**, a plurality of navigation keys **134**, selection keys **136**, as well as the standard items used for cellular telephony including an earpiece **140** and a mouthpiece **142**. The cellular telephone communicates with the cellular system **152** via wireless communication **150**.

The lower power transceiver **120** communicates with a corresponding transceiver **162** mounted in a vehicle-mounted phone part **160**. The vehicle-mounted phone part **160** is preferably mounted in vehicle e.g. an automobile, and is powered from the automobile's battery. The vehicle-mounted phone part ("car kit") **160** also transmits and receives RF using the external antenna on the automobile.

The portable phone communicates with the car kit using Bluetooth. While the present invention is not limited to use with Bluetooth, the techniques of Bluetooth are often highly advantageous. The detailed implementation of Bluetooth can be found in Bluetooth specification volume 2, version 1.0A, Jul. 26, 1999.

In general, the Bluetooth specification is a standard intended for relatively short range, e.g., 100–200 meter, wireless communication. Bluetooth can operate at a number of different power levels, including a 0 dBm level transmit power (e.g., 1 milliwatt) in which the communication has a 10-meter range, and a 20 dBm transmit power (e.g., 100 milliwatts) which has a 100-meter range. Bluetooth operates at around 2.4 GHz, and is capable of transmitting data at about 1 Mbit/sec. Bluetooth is a multiple access system, which uses a frequency-hopped spread spectrum with time division duplex. The frequency hopping occurs at about 1600 hops/sec. Each Bluetooth device has a unique 48-bit address.

A basic Bluetooth piconet **200** is shown in FIG. **2**. The piconet **200** is between a master **210** and one or a plurality of slaves such as **220**. Each of the units in the piconet includes an electronic device **212**, and Bluetooth transceiver unit **214**.

The device that initiates the communication is always called the master. The master can communicate with one, or more than one, slave unit. The piconet **200** shown in FIG. **2** is illustrated as communicating with a plurality of different slave units. The master unit controls the traffic and provides a time reference for the slaves. All the units share the same frequency-hopping sequence defined by the master. In addition, one Bluetooth device can become a member of several piconets.

As described above, each Bluetooth unit is uniquely identifiable based on its 48-bit address. Each Bluetooth unit can also include a Bluetooth device name, which is a user-friendly text string, having a maximum of 240 bytes. A Bluetooth passkey can be included, that forms a personal identification number. This can restrict access.

Bluetooth's multiple access scheme operates based on the master sending a request and waiting for a response. The send respond is based on the master's clock. All units in the and piconet synchronize with the master's clock.

A number of other features are defined by the Bluetooth Specification, including additional features for initiating and terminating communications among the units.

The basic system operates as described with reference to FIG. **3**. At step **300**, the phone **100** and the vehicle-mounted part **160** ("car kit") come within range of each other.

At step **310**, the car kit **160** and phone discover each other using a low power communication scheme that is different than the communication scheme used by the cellular network. In this embodiment, that scheme is by Bluetooth. Step **310** makes at least one of the car kit **160** and/or the handheld phone **100** aware of one another.

At step **320**, the car kit and handheld phone exchange information. This exchange of information between the car and phone determines information which allows them to communicate. At step **330**, the car kit and the phone, in communication with one another, carry out communication with the cellular system. In a preferred embodiment, the communication with the cellular system includes transceiver operations by the car kit.

After the communication is finished, communication needs to revert. Step **340** shows a reversion, in which the car kit and the hand held phone lose communication with one another.

Step **310** defines the car kit and hand held phone discovering each other via Bluetooth. This can occur in a number of different ways. A first embodiment of step **310** is referred to herein as mode **1**A and described with reference to FIG. **4**. In this embodiment, communication is activated automatically by bringing the devices into range of one another.

At step **400**, a driver with a telephone handset enters the car. The car senses the "event" of the user entering. The event can be sensed by any action that the car can sense, including actuating the car ignition key, a seat sensor detecting the driver sitting on the car's seat, a tilt sensor detecting the door being opened, a burglar alarm de-initiation, or any other event which can be determined by any circuitry in the car. Any of these events indicates that the user is close to the car.

When the car detects an event, the car kit **160** starts transmitting inquiries at step **402**. The inquiries are sent periodically until operation is established, or for some fixed period. However, the polls are only sent in response to an event detection to minimize radio traffic on the Bluetooth system. Otherwise, a parking lot full of automobiles could each be conducting Bluetooth polls, clogging the Bluetooth band. In addition, this conserves vehicle battery power.

The handset in this embodiment is periodically scanning for inquiries. Step **404** represents the handset receiving an inquiry. The handset sends an inquiry response back to the car kit. The inquiry response includes the Bluetooth device address BD_ADDR.

At step **406**, the car kit **160** determines if one or many units have responded. If only one unit has responded, then the car unit pages the responding handset at **408**. If more than one unit has responded, then the car unit compares each received Bluetooth address with a list of recognized addresses at **410** and selects one of those for paging. After paging one, the car kit can subsequently page another of the units, or can allow communications with only one of the units.

A piconet is established at **420**, with the car kit **160** being established as the master and the selected handset as the slave. Additional piconets can also be established between the car kit **160** and other Bluetooth devices. The master unit then initiates an SDP session at **422** by querying the handset for supported services. Communication proceeds.

The message flow as described above is also shown in FIG. **5**.

Mode **1**A allows the car kit to establish communication with any recognized Bluetooth device.

Mode **1**B allows communication with only those devices that are on an allowed list. Step **430**, shown in FIG. **4**, is executed only for mode **1**B. Step **430** illustrates comparing the Bluetooth address with a list of addresses corresponding to handsets that have been approved. If the current address is not in the list, the handset is ignored at step **432**. If the current address is in the list, however, then control passes to step **408** where the recognized unit is paged.

Mode **1**C operates by responding to the Bluetooth text addresses, rather than to the Bluetooth **48** bit address. Step **440** in FIG. **4** shows mode **1**C, in which the car unit requests the handset to reveal its Bluetooth device name (VD_ name). The Bluetooth device name is compared with a list of pre-authorized names at **442**. Paging is allowed only if the handset is recognized.

The mode **2** operation is shown in FIGS. **6** and **7**. The mode **1** operation uses Bluetooth inquiries from the car kit to page the handset. This means that the handsets must be "discoverable" by the Bluetooth inquiries. Mode **2** does not require discoverable handsets. In FIG. **6**, an initial set up **600** is carried out, in which the car kit is programmed to work with one or a list of specific handsets. An event occurs at step **602**, such as described above. Responsive to this event at **602**, the car unit begins paging Bluetooth devices, but only those devices that are on its list, at step **604**. The paging continues until a device responds, or a preset time passes.

If one of the paged handsets responds at **610**, a piconet is established at **612**, using the car kit **160** as the master. Again, the unit initiates an HTP session. FIG. **7** shows more detail on this message flow.

An advantage of mode **2** is that only specific Bluetooth devices are paged, and the Bluetooth device hence need not be discoverable. Certain security may also be provided, since the device must be authorized in advance.

Mode **3** requires manual actuation to establish the piconet. Step **800** in FIG. **8** shows the unit in the car periodically scanning for pages. Note that the car kit scans for pages, as opposed to scanning for inquiries. In generally the car kit will not be discoverable.

At step **802**, the driver approaches the car, and presses a special key on the handset keypad which is preset to activate car/phone operation.

The handset may store a list of several car unit identifiers, e.g. their Bd_addr. The key press causes the handset to page the car kit at **804**. The car kit responds at **806**. A piconet is then established with the handset as the master at **808**.

At step **810**, a master-slave switch operation is carried out. This makes the car kit become the master of the piconet. This switchover minimizes power consumption in the handset.

Authentication may then be carried out at **812**.

A mode **4** operation is shown in FIG. **10** which provides increased security. This system requires manual initiation on both the car kit **160** and on the hand unit **100**. FIG. **10** shows the driver pressing a key on the car kit **160**. This causes the car unit to start scanning for inquiries and pages for a limited time. The limited time can be for example, 30 seconds.

At step **1002**, the driver presses a key on the handset, causing the handset to start transmitting inquiries at **1004**. The car kit, which is scanning for these inquiries, responds to one of the inquiries at **1006** and reveals its Bluetooth address to the handset. The handset then pages the car unit at **1008**. When the car unit responds, a piconet is established with the handset as the master at step **1010**.

At step **1012**, the handset requests and displays information from the car kit. This includes the car registration number. The driver acknowledges the desire to connect to the particular unit by pressing a key on the handset keypad? At step **1014**, a master slave switch is carried out, leaving the car unit as the master.

FIG. **11** shows a modification of the FIG. **10** embodiment, which enables a "guest" handset, e.g. an unrecognized handset which has not been previously used. In FIG. **11**, as in FIG. **10**, an actuation is carried out on the car kit at step **1100**. This causes the car unit to start sending inquiries. Next, at step **1102**, the driver holds the handset within a few inches of the car kit. The driver presses the key on the handset at **1104**, causing the handset to start scanning for inquiries and pages. At step **1106**, the handset receives an inquiry, and sends a reduced power inquiry response at **1108**. The inquiry response at **1108** is at a power that is sufficiently low to make the communications range relatively short. The inquiry response includes the handset's Bluetooth device address.

Step **1110** determines if the car kit has received responses from more than one Bluetooth device. If so, the activation procedure is stopped at **1112**. If only a single response is received, the car unit starts paging the responding handset at **1114**. Both units—the car kit and the handset—transmit at nominal power after this page. At step **1118**, the handset responds to one of the pages, and establishes a piconet with the car unit as the master.

The car/phone processing is carried out at step **320**. A first mode of car/phone processing is a relatively simple hands-free system, in which the hand-held unit and the car-mounted unit communicate with one another. The car-mounted unit becomes a slave of the hand-held unit. The first mode is described herein.

A second mode of the car-phone processing effects an identity transfer mode, in which the car mounted unit obtains the identity of the handset, and transmits as though it was the handset. In this second mode, the ESN and other cellular information from the handset are sent from the car kit, thereby causing the car kit to operate and emulate the handset. In that mode, the car kit takes the identity of the hand-held unit.

A flowchart of the operation in this second mode is shown in FIG. **12**. Note that this occurs after the communication/authentication sequence noted above. At step **1200**, the car takes the identity of the handset. This means that the car kit transmits the ESN, "NAM" and other electronic information that are associated with the handset, and the billing that is done for the handset. Since the cellular phone is identified by this identity information, the car kit becomes, the cellular handset.

Once the transmission has been completed, the car takes the phone's identity at step **1200** and therefore transmits and receives just as if it were the cellular phone. Step **1210** shows the car emulating the cellular phone. The car kit operates to transmit the ESN and NAM from the hand-held phone. The car kit preferably operates in hands-free mode during this operation, that is, so that the car kit becomes a speakerphone.

At step **1220**, a private conversation is initiated using the handset. A private conversation is carried out using the cellular handset in combination with the car kit. The car, which is the master of the piconet, initiates a Bluetooth wireless communication with the hand-held phone. The communication is via Bluetooth and can be a digital communication. Voice spoken into the hand-held unit is sent to the car kit via Bluetooth. Received audio from the cellular communication is digitized and sent to the handset via Bluetooth communication. Step **1220** hence represents wireless communication via a local piconet, and that the communication carried with the handset is then transmitted to the cellular network and becomes a cellular communication. In this way, the cellular handset becomes a cordless phone associated with the car kit.

The mode **1** operation is shown in FIG. **13**. Effectively, only step **1220** is carried out in this step. The car phone becomes a speakerphone accessory for the handset. As shown in step **1300**, the handset communicates with the car kit via Bluetooth. The handset still carries out the communication, but uses the car kit as an accessory.

Note that, as described herein, the car kit can be more than just a speakerphone, and also can act as an RF booster for the handset.

FIG. **14** shows the housekeeping routine which is carried out according to one mode of the operation. At step **1400**, a PIN or other password is entered into the car kit. This causes a menu on the car kit to be brought up, allowing the different housekeeping options. A list of allowable Bluetooth addresses which can be entered is found at **1402**. Since the Bluetooth addresses are 48-bits in length, preferably this is done in an automated manner. For example, this could be done by initiating the mode, as shown in FIG. **14** which begins polls at the lowest possible power mode, for all Bluetooth devices within range. A very low power mode is used at step **1404** so that only devices within a short distance, e.g. 12 inches, will respond. If more than one device responds, the routine exits. If only one device responds, then that device is added as an allowable device into the list. The Bluetooth address, as well as any other identifying information (phone type and model, or Bluetooth text address) is entered into memory at **1406**.

In one of the modes described above, the system uses Bluetooth text addresses. This includes more user friendly addresses, and hence can be manually entered via the user interface at step **1408**. The manual entry of text addresses has higher security, since there is no transmission to be intercepted in this mode.

Step **1410** represents the entry of phone identity. The phone identity is typically thought of as its electronic serial number or ESN, and the phone's NAM and phone number

contents. At **1412**, a low power, secured entry mode is established, in which the system asks a specified unit from its Bluetooth address for its ESN. This is done at low power, with for example a 1-meter range, so that the possibility of data interception becomes minimal. In addition, since most cellular phones already include encryption facilities, the transmission can be encrypted for even further security. The phone responds with its ESN at **1414**. The received ESN is stored into the memory of the car kit at **1416**.

Step **1210** described above recites that the car kit emulates the cell phone.

Step **1410** allows specified phones or all phones to be removed from the list. For example, when the automobile changes ownership, the user may want to totally reset the contents of the memory for security purposes. In addition, temporary entry of information can be allowed, and can be removed via the removal step.

The mode two operation, in which the car kit emulates the cell phone, relies on the car obtaining the virtual identity of the cell phone. In one mode, described above, the ESN is stored in the memory. This mode operates as shown in FIG. **15**. The system searches for a recognized Bluetooth address at **1500**. If a recognized Bluetooth address is found, then the phone operates with the stored ESN and NAM associated with the recognized Bluetooth address at step **1502**. This puts ear kit the phone into a virtual phone emulating mode.

FIG. **15A** represents the prestored mode. An alternative mode is shown in FIG. **15**, when the car does not recognize the Bluetooth address is that a short distance request for the address is sent by the car kit at **1510**. The phone responds by transmitting, in the low power mode, and via encrypted communication, its ESN and NAM. The transmitted ESN and NAM are stored within a memory of the car kit. They can later be used to "identity" of the phone during an identity transfer mode.

Step **340** in FIG. **3** is controlled out by the car kit periodically polling the handset over the short range interface. So long as the handset responds to the polls, no changes are made. However, when the car kit determines that emulation has terminated for one reason or another, e.g., the car phone does not respond, then normal communication is re-enabled.

Another mode contemplated herein is carried out when the hand held cell phone is not brought into the car. When the user forgets the cell phone, for example, the car kit can still function without the handset. Since the car kit includes all necessary cellular equipment, it can transmit and receive using a virtual telephone number. This incurs higher service charges, but may be used on an as-needed basis. Moreover, this enables emergency services such as Telematics or Mayday even without a hand-held phone being present.

In order to save on power, the mode 1 operation may operate in a "park" mode once communication has been started. The park mode saves on power since it prevents communication during most of the time. However, the idle mode enables quick refresh of the operation so that communication can restart in a relatively short time.

After communication is re-established at step **330**, the system enters a hands-free operation idle mode. The Bluetooth ACL link is established between the car unit and the handset. The car unit acts as the master of the piconet. If necessary, this may include switching between slave and non-slave, so that power consumption is minimized.

After the driver has entered the car, a Bluetooth ACL link is established between the HF unit and the handset, with the car kit acting as master of the piconet. These will remain active as long as the two units stay within range.

The car kit then starts an SDP session to query the handset for the services offered.

Having verified that the handset supports HF operation, the car kit commands the handset Bluetooth module into Park mode.

In Park mode, the handset Bluetooth module wakes up periodically to listen to a beacon transmission from the car kit. This allows the handset to stay synchronized to the car kit and to detect when the car kit is de-activated or falls out of range. The time between beacon receptions is spent in sleep mode to preserve battery lifetime. If the handset does not receive a beacon transmission for some period of time, e.g., 100 seconds it automatically de-activates HF mode.

Every Nth beacon transmission, the car kit's Bluetooth module sends an unpark command to the handset. When the handset Bluetooth module responds, it is polled by the handset's Bluetooth module. By returning a NULL packet, the handset signals that there is no data to be transferred. The car kit Bluetooth module then commands the handset's Bluetooth module back into Park mode. This handshake procedure is executed to ensure the car kit that the handset is still within range and operating in HF mode.

The driver dials a phone number on the car kit and presses send, or makes some other indication of call initiation.

The HF Bluetooth module uses the next beacon transmission to unpark the handset's Bluetooth module.

When the handset Bluetooth module responds, the car kit, instead of unparking the handset, now starts an exchange of upper-layer protocol messages in which it commands the handset (using the ATD command) to originate a call to the specified phone number.

The handset contacts the cellular network and requests call origination. On the PSTN side, a voice connection is established to the remote switch.

The handset Bluetooth module uses the existing ACL link to establish a two-way SCO voice link to the HF unit.

The cellular network returns an alert message confirming that a voice connection has been established with the remote switch. The handset starts generating a ring back tone in the receive audio path, which is received by the car kit unit over the SCO link.

The subscriber on the remote end goes off hook and the conversation begins. The conversation progresses as follows:

1) The handset receives a page from the cellular network and responds on the access channel. It is then assigned a traffic channel by the base station.

2) The handset waits until the next beacon transmission and then requests to be unparked in the following access window.

3) Upon receiving this request, the car kit Bluetooth module sends an unpark message to the handset over the beacon channel. The ACL link is now re-established.

4) The handset starts an exchange of upper-layer protocol messages over the ACL link, alerting the car kit that there is an incoming call (AT result code RING).

5) The HF unit generates a ring sound to alert the driver.

6) When the driver goes off-hook by pressing a button on the console or steering wheel, the HF unit sends an AT command (AT+CKPD) alerting the handset that the driver whishes to answer the call.

7) The handset Bluetooth module establishes an SCO voice link to the HF Bluetooth module.

8) Conversation begins.

Other embodiments are within the disclosed embodiment. For example, and importantly, the present application is not limited to use with Bluetooth. Other wireless transmission techniques and protocols can be used. In addition, while specific handshaking sequences and techniques have been disclosed, other such techniques are possible.

What is claimed is:

1. A portable phone device comprising:

a first portable phone housing, having a user interface, at least a microphone and speaker, and a cellular transceiver therein, said cellular transceiver operable to transmit signals from said microphone to a cellular network and receive signals from said cellular network and couple them to said speaker, and also having therein a second transceiver, operating to consume a lower power than said cellular transceiver, said second transceiver having a unique device address which uniquely identifies said second transceiver from other transceivers, operating in a multiple access system using time slots over a spread spectrum protocol (X), said second transceiver enabling operation with a remote device which changes a mode of operation of said telephone to a changed mode of operation; wherein said user interface on said portable telephone includes an initiation button which is actuated to initiate a communication using said second transceiver.

2. A portable phone device comprising:

a first portable phone housing, having a user interface, at least a microphone and speaker, and a cellular transceiver therein, said cellular transceiver operable to transmit signals from said microphone to a cellular network and receive signals from said cellular network and couple them to said speaker, and also having therein a second transceiver, operating to consume a lower power than said cellular transceiver, said second transceiver having a unique device address which uniquely identifies said second transceiver from other transceivers, operating in a multiple access system using time slots over a spread spectrum protocol (X), said second transceiver enabling operation with a remote device which changes a mode of operation of said telephone to a changed mode of operation; wherein said remote includes a vehicle-mounted device, said vehicle-mounted device also including another transceiver which having a unique device address which uniquely identifies said another transceiver from other transceivers, operating in a multiple access system using time slots over a spread spectrum protocol and which communicates with said second transceiver in said telephone; and

said vehicle mounted station monitors for an event indicating that a user is present.

3. A device as in claim 2, wherein said vehicle mounted station sends inquiries based on detecting said event.

4. A portable phone device comprising:

a first portable phone housing, having a user interface, at least a microphone and speaker, and a cellular transceiver therein, said cellular transceiver operable to transmit signals from said microphone to a cellular network and receive signals from said cellular network and couple them to said speaker, and also having therein a second transceiver, operating to consume a lower power than said cellular transceiver, said second transceiver having a unique device address which uniquely identifies said second transceiver from other transceivers, operating in a multiple access system using time slots over a spread spectrum protocol (X), said second transceiver enabling operation with a remote device which changes a mode of operation of said telephone to a changed mode of operation; wherein said transceiver responds only to requests which include a unique address of said portable telephone.

5. A method of communicating, comprising:

using a portable handset to communicate over a cellular network;

also using said portable handset to communicate with a remote station using a second protocol, such that said remote station and said handset contact one another using said second protocol; and

after said remote station and said handset contact one another, at least one operation of said cellular phone being carried out by said portable station; wherein

said at least one function is a cellular transmission function:

said portable unit emulates an identity of said cellular phone; and

said transmitting comprises establishing in advance, information indicative of said identity, indicating that said phone is present, and, when said phone is indicated as present, using said identity.

6. A method as in claim 5, further comprising storing said identity.

7. A method of communicating, comprising:

using a portable handset to communicate over a cellular network;

also using said portable handset to communicate with a remote station using a second protocol, such that said remote station and said handset contact one another using said second protocol:

after said remote station and said handset contact one another, at least one operation of said cellular phone being carried out by said portable station; and

determining an event indicative of a user being in the automobile, and

sending a poll only when said event is detected; wherein said connection includes a poll being sent by said remote unit.

8. A method of communicating, comprising:

using a portable handset to communicate over a cellular network;

also using said portable handset to communicate with a remote station using a second protocol, such that said remote station and said handset contact one another using said second protocol;

after said remote station and said handset contact one another, at least one operation of said cellular phone being carried out by said portable station; and

storing a list of allowed devices, wherein only devices on said allowed list are accepted when responding to said poll; wherein

said connection includes a poll being sent by said remote unit.

9. A method of communicating, comprising:

using a portable handset to communicate over a cellular network;

also using said portable handset to communicate with a remote station using a second protocol, such that said remote station and said handset contact one another using said second protocol; and

after said remote station and said handset contact one another, at least one operation of said cellular phone being carried out by said portable station; wherein

said communicating comprises paging only a plurality of specific addresses;

said communicating comprises determining a specified event indicative of a user being in the vehicle;

beginning sending said polls responsive to said specified event; and

said event is a detection of a user entering an automobile.

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